

# Soil Vapor Intrusion and Indoor Air Quality

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# Indoor Air Quality (IAQ)

- ◆ 14 years experience at NYSDOH investigating IAQ issues.
- ◆ General IAQ complaints: ventilation and thermal comfort
- ◆ Exposure Triangle:



- ◆ Contaminant sources - outdoor air, indoor source, **soil vapor intrusion**
- ◆ Driving Force - ) p - natural, mechanical, variability
- ◆ Public perception

# Observations on Vapor Intrusion Cases

- ◆ Petroleum and chlorinated solvents
  - ◆ underground gasoline spills, diesel spills
  - ◆ fuel oil spills in basements - post cleanup
  - ◆ perc sites on Long Island: indoor air usually affected
- ◆ Soil contamination vs. groundwater
- ◆ Johnson & Ettinger Model
- ◆ Vapor Intrusion Guidance - pulls it together.

# Pressure Gradients " ) p" Examples

- ◆ Helen Hayes Hospital - solvent odors in 3 buildings
  - ◆ Clay soils with porous utility bedding
  - ◆ ) p - elevator piston action, stack effect
- ◆ Stillwater Municipal Building - post tank excavation odors in building, Monday morning problem
  - ◆ Soil excavation met cleanup goals
  - ◆ Vapor readings at post footers inside building
- ◆ Schenectady County Home - fuel oil odors after cleanup at onset of heating season
  - ◆ Concrete and several feet of soil removed
  - ◆ Floor crack, clothes dryer, no SVS piping installed

# Sensitive Receptors - Politics

- ◆ Elmira, NY High School - former industrial site - high profile case
  - ◆ Concerns with increased cancer incidence
  - ◆ Indoor air and soil gas study looked at air, soil gas and ) p.
- ◆ Hyde Park Neighborhood - MTBE in groundwater
  - ◆ Vapor intrusion into indoor air?
  - ◆ MTBE in the indoor air, not in soil gas.
- ◆ Flatbush Bus Depot - diesel spill 12 feet under houses.
  - ◆ Angry residents and politicians.
  - ◆ Vapors not in soil gas or indoor air.

# Dry Cleaner Sites

- ◆ Franklin Cleaners - Indoor air impacts from soil and ) p
  - ◆ Chinese restaurant had the highest levels - ) p
- ◆ Stanton Cleaners - soil and groundwater impacted
  - ◆ Tennis court indoor air impacted from soil - SVS
  - ◆ Upgradient Condo impacted via garage floor drain and exhaust fan ) p - Tide Flex backflow preventer
  - ◆ Further evaluation warranted based on Guidance

# Indoor Air Testing - pre and post remediation

## Summary of PERC Concentrations in Indoor Air at Plaza Tennis

Results are reported as micrograms PERC\* per cubic meter of air ( $\mu\text{g}/\text{m}^3$ )

Sampling Location	12/97-2/98	9/98	10/98	11/98	2/99	3/99	6/99	9/99	12/00
	NO REMEDIAL MEASURES		AFTER REMEDIAL MEASURES						
Court 1 Playing Area	1400-2800	1301	190-210	246	180	n/a	<10	24 - 25	80-90
Court 1 Behind Curtain	1300-2500	1498-1512	220	321-325	366-434	n/a	n/a	50	90
Court 2 Playing Area	120	67.8	n/a	n/a	18	n/a	n/a	4 - 5	20
Court 3 Playing Area	260 - 320	122 - 149	n/a	n/a	n/a	29 - 32	< 10	3	< 5
Lobby/Office Area	1200-1400	163	19 - 30	n/a	76 - 84	32	n/a	5 - 6	20

Installation of Foundation  
Vent at Court 1

Operation of Soil Vapor  
Extraction System begins

Upgrade of Soil Vapor  
Extraction System

### NOTES:

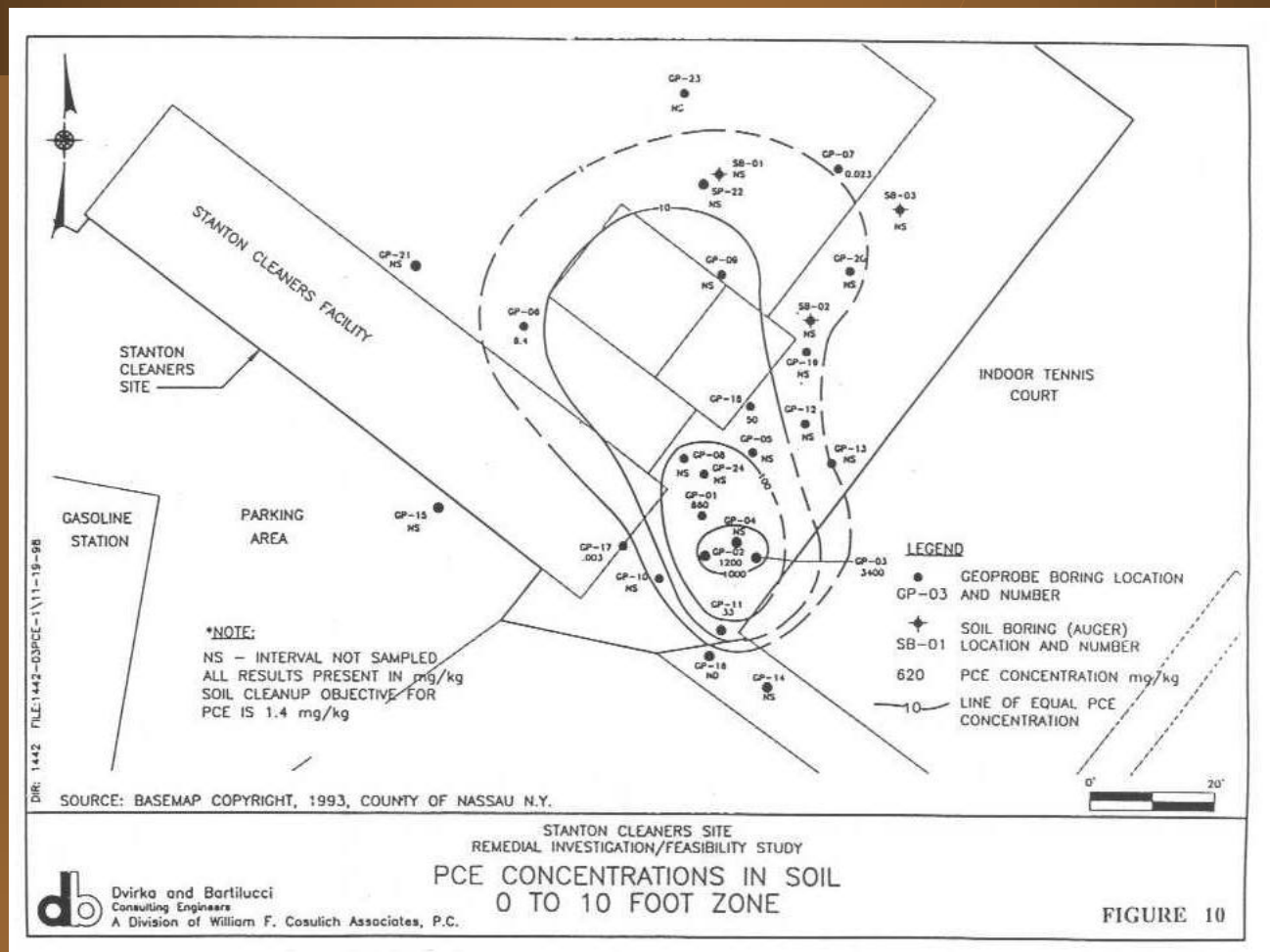
"PERC", the common dry cleaning chemical, is also known as tetrachloroethene, perchloroethylene, or PCE. The New York State Department of Health (NYSDOH) has issued a guideline value of  $100 \mu\text{g}/\text{m}^3$  for PERC in air.

"n/a" indicates sample not collected.

"<" means less than the value listed; the value listed is the lower detection limit of the laboratory.

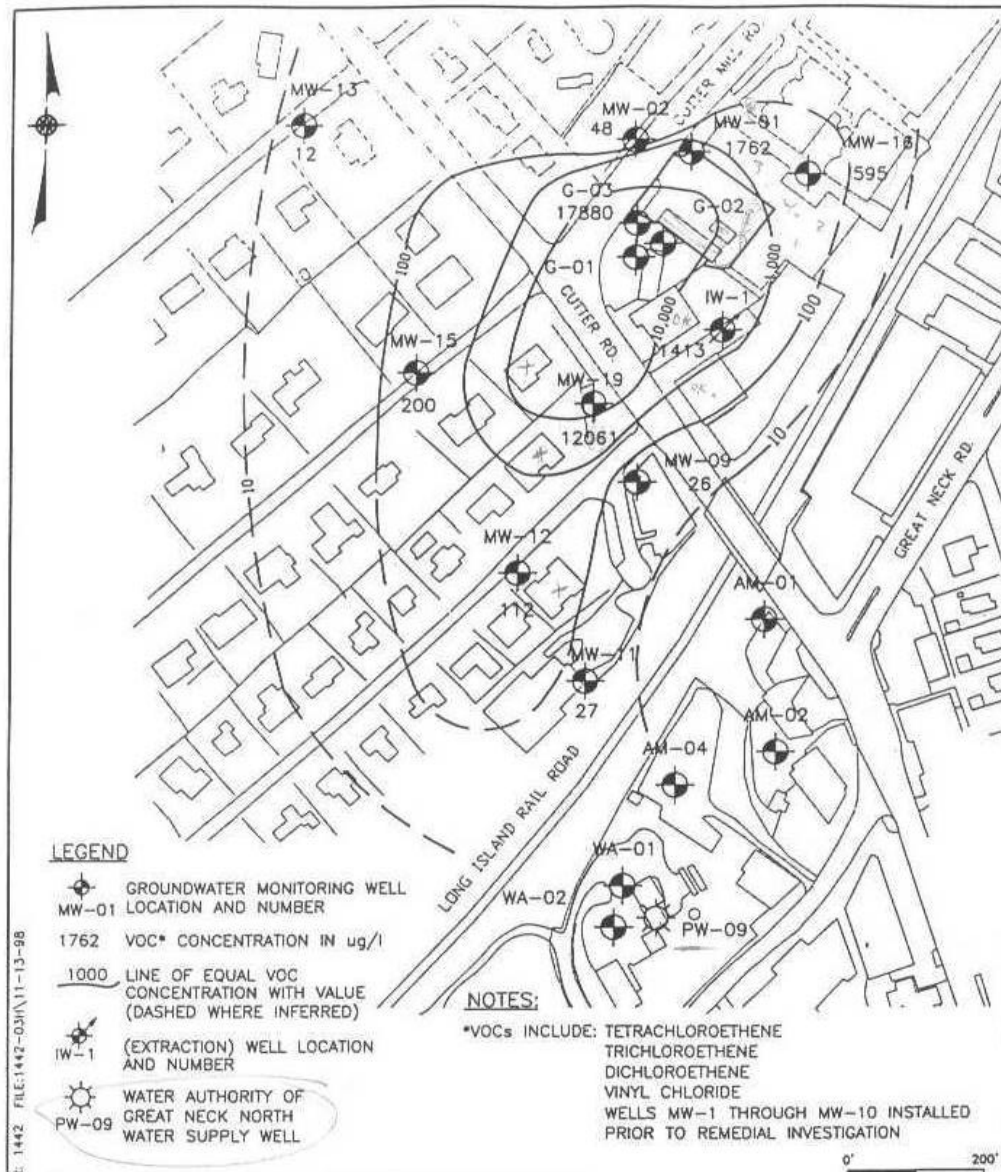
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# Stanton Cleaners PCE Shallow Soil concentrations





# Stanton Cleaners Groundwater Contaminant Contours



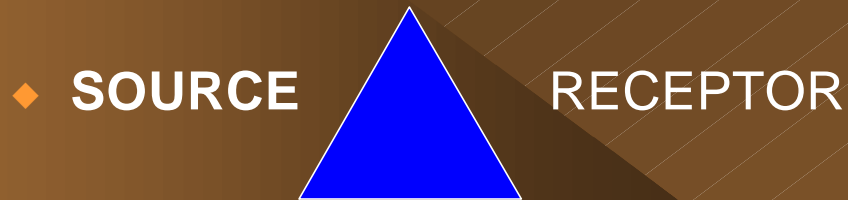
## Basic Concepts from the Guidance

### Exposure Control vs. further assessment

- ◆ Primary Screening - identifies sites where indoor air impacts from vapor intrusion are **unlikely** and no further action is warranted.
- ◆ Secondary Screening - measured or reasonably estimated indoor air, soil gas or groundwater  $> X$ , If soil gas or groundwater are  $> 100X$  then IRM. If  $< 100X$  then do site-specific assessment.
- ◆ Site Specific Assessment - Adequate site specific data to demonstrate the presence or absence of a completed pathway.
  - ◆  $X$  - Acceptable indoor air concentration - NYS currently uses typical background vs. risk-based target indoor air concentration - thus affecting the criteria for advancing from screening to site-specific pathway assessment.

# Benefits of Guidance

- ◆ Provides a procedure to evaluate indoor air impacts from soil vapor intrusion and a basis to take corrective action if necessary.



- ◆ Provides an option to effect quick interventions through a simplified approach (mitigation vs. monitoring).
- ◆ Screening provides adequate information to convince “sensitive” receptors that actions are justified.